

Private Domestic Well Testing in the Santa Fe Region

MCQUILLAN, Dennis¹, LINHOFF, Benjamin², LONGMIRE, Patrick², REARICK, Michael², GALLEGOS, Robert³, TORRES, Karen⁴, WIMAN, Stephen⁵, SANCHEZ, Melanie¹, and KING, Amanda³; ¹New Mexico Environment Department, 525 Camino de los Marquez, Suite 1, Santa Fe, NM, 87505, dennis.mcquillan@state.nm.us; ²Los Alamos National Laboratory, MS D469, Los Alamos, NM 87545, plongmire@lanl.gov; ³City of Santa Fe, P.O. Box 909, Santa Fe, NM 87504-0909, rmgallegos@ci.santa-fe.nm.us; ⁴Santa Fe County, P.O. Box 276, Santa Fe, NM 87504, [kторres@co.santa-fe.nm.us](mailto:ktorres@co.santa-fe.nm.us); ⁵Good Water Company, 933 Baca St., Santa Fe, NM 87505, skwiman@goodwatercompany.com

The N.M. Environment Department, Los Alamos National Laboratory (LANL), the City of Santa Fe, Santa Fe County and the Good Water Company sampled 475 private domestic wells throughout the Santa Fe region during 2009 for analyses of major anions/cations, heavy metals, trace elements, fluoride, and nitrite/nitrate by LANL. Test results were compared with U.S. Environmental Protection Agency (EPA) Maximum Contaminant Levels (MCLs) for public drinking-water systems, and with N.M. Water Quality Control Commission (WQCC) groundwater standards. Well owners were provided test results along with interpretive letters including, when necessary, information on potential health risks and options for water treatment.

Eighty-two percent of all private wells tested did not contain any constituents at concentrations exceeding human health standards set by EPA or WQCC. Potentially hazardous concentrations of arsenic, uranium, fluoride, nitrate, selenium, and barium, however, were detected in 48, 29, 11, 9, 3, and 1 individual wells, respectively. Beryllium, cadmium, chromium, lead, mercury, radium, and thallium were not detected at concentrations exceeding human health standards in any well. Six percent of the wells tested contained sulfate, chloride, and/or total dissolved solids at concentrations exceeding WQCC aesthetic standards, but did not contain any constituents at concentrations posing health hazards.

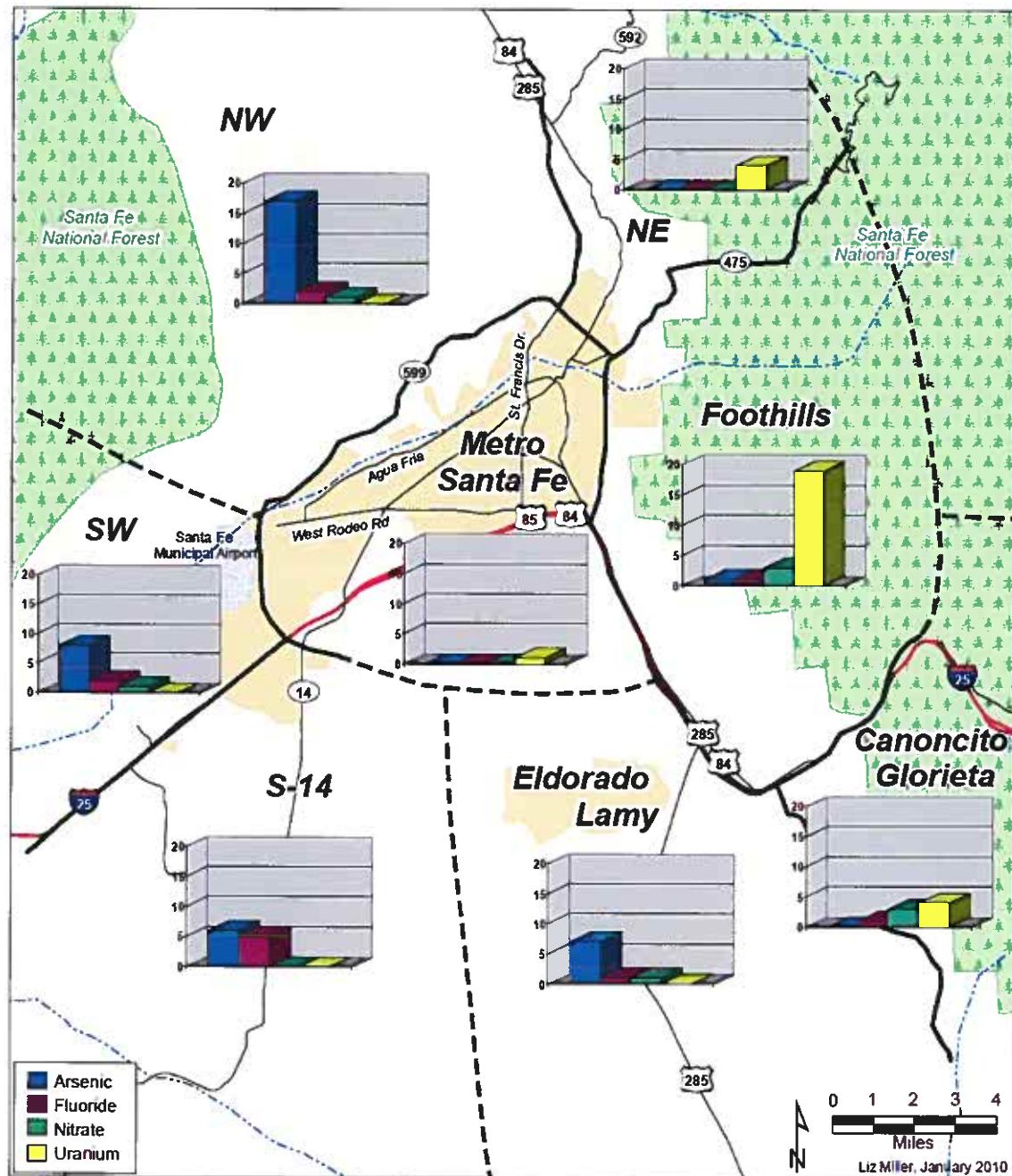
Arsenic exceeding the EPA MCL of 0.01 mg/L was detected in 10% of the wells tested (20% in western Santa Fe, and 15% in Eldorado). Arsenic was positively correlated with pH, sodium, fluoride, lithium, and boron. Upwelling of deep mineralized groundwater along fractures and faults in western Santa Fe transports soluble arsenic into shallower aquifers. Arsenic also may be released during desorption reactions with clay minerals and hydrous ferric oxide occurring along flow paths in shallow aquifers.

Uranium was detected in excess of the EPA and WQCC health standards, both set at 0.03 mg/L, in 22% of the wells tested in the mountain front area. Proterozoic rocks are the likely source of uranium. The positive correlation of uranium and sulfate in mountain front groundwater suggests that oxidation of sulfide minerals in the Proterozoic rocks may be a potential release mechanism for uranium.

Fluoride exceeding the WQCC groundwater health standard of 1.6 mg/L was detected in water with low concentrations of calcium in isolated areas throughout the study area. Calcium can control fluoride concentrations by precipitation of fluorite. Low concentrations of calcium, potentially resulting from cation exchange, can enhance the increase of fluoride concentrations.

Nitrate detections exceeding the EPA MCL of 10 mg/L as N appear to be associated with localized contamination from onsite septic systems, particularly in the fractured bedrock terrain of the mountain front area. Fractured bedrock generally has a higher degree of vulnerability to contamination from septic systems and other waste discharges relative to basin fill sediments.

Number of Wells with Concentrations Exceeding Human Health Standards



Sample ID*	Field Area**	Cations								Anions								Trace Elements, Metals, Rads								TDS
		Ca mg/L	Mg mg/L	Sr mg/L	Na mg/L	K mg/L	HCO ₃ mg/L	CO ₃ mg/L	SO ₄ mg/L	Cl mg/L	Br mg/L	F mg/L	NO ₃ -N mg/L	PO ₄ mg/L	As mg/L	B mg/L	Ba mg/L	Li mg/L	Se mg/L	U mg/L	Ra 226+228 pCi/L	Rads units	mg/L			
EPA MCL	WQCC	---	---	---	---	---	---	---	250	250	---	2.0	10.0	---	0.010	---	1.0	---	0.100	0.75	1.0	---	0.05	0.03	30	6 to 9 1000
0906241337PRA	Treated - Soft	1	0	0	4	161	196	0	32	20	0.3	0.7	2.9	0.08	0.002	0.44	0.0	0.00	<0.001	0.0018	0.00	0.00	7.71	440		
0906231120JAM	Treated - Soft	<0.01	<0.01	<0.01	200	0	445	0	17	63	0.0	0.4	0.0	<0.01	0.002	0.02	0.0	0.00	0.005	0.0049	0.00	0.00	7.65	749		
0906231156COU	Treated - Soft	1	1	0.1	598	19	461	0	908	72	0.9	1.2	0.0	<0.01	0.002	0.43	<0.001	0.04	0.002	0.0064	0.00	0.00	8.07	2074		
0906241340SLA	Treated - Soft	0.99	0	0.0	57	3	163	0	4	3	0.1	0.4	0.0	0.67	0.001	0.05	0.0	0.00	<0.001	<0.0002	0.00	0.00	7.53	260		
0906241520ZIC	Treated - Soft	0.5	0	0.0	113	473	438	0	321	6	0.2	0.6	<0.002	0.06	0.001	0.11	<0.001	0.10	<0.001	<0.0002	-0.14	0.00	0.00	7.86	1364	
0906241540WEL	Treated - Soft	11	5	0.0	490	89	553	0	640	14	0.1	0.9	<0.002	0.11	0.003	0.07	<0.001	0.01	<0.001	0.0071	0.00	0.00	8.11	1817		
090625140SWA	Treated - Soft	0.14	0	0.0	13	532	574	0	193	20	0.4	1.4	<0.002	0.3	0.001	0.22	<0.001	0.01	0.002	<0.0002	0.00	0.00	7.65	1347		
0906261410JIT	Treated - Soft	83	13	0.3	225	243	469	0	399	35	0.1	0.2	5.7	12.71	0.001	0.34	0.0	0.12	0.002	<0.0002	0.00	0.00	7.75	1513		
0906241335WOO	Treated - Soft	1	0	0.0	782	518	369	0	87	1453	<0.01	0.4	4.3	<0.01	0.001	0.06	0.0	0.01	0.087	0.0211	0.00	0.00	7.76	3234		
0906251245ROW	Treated - Soft	4	2	0.0	255	6	442	0	84	109	1.5	0.5	4.3	0.035	0.003	0.05	<0.001	0.01	0.011	0.0362	0.00	0.00	7.63	923		
0906261130LON	Treated - Soft	2	0	0.0	30	187	314	0	33	21	0.3	0.6	1.3	<0.01	0.001	0.05	0.0	0.02	0.003	0.0084	0.00	0.00	8.02	609		
090624138FOR/HIT	Treated - Soft	0.03	0	<0.001	1	111	169	0	14	6	0.1	0.5	1.4	<0.01	0.005	0.05	<0.001	0.00	0.001	0.0016	0.00	0.00	7.85	324		
090624110WAR	Treated - Soft	3	1	0.0	55	428	468	0	78	151	0.2	0.4	7.7	<0.01	0.002	0.12	0.0	0.03	0.010	0.0138	-0.07	0.00	0.00	6.52	1242	
090623121AME	Unknown	111	20	1.0	22	3	284	0	69	61	<0.01	0.3	9.9	<0.01	0.005	<0.002	0.2	0.02	0.004	0.0052	0.00	0.00	7.82	594		
090623108STR	Unknown	45	15	0.8	21	4	243	0	16	14	<0.01	0.3	1.4	<0.01	0.002	0.04	0.2	0.04	0.001	0.0069	0.00	0.00	8.05	383		
0907021315DUK	Unknown	104	29	0.6	25	5	401	0	89	29	0.4	0.5	2.8	<0.01	0.001	0.05	0.0	0.03	0.002	0.0223	0.00	0.00	7.69	706		
0907231501HUN	Unknown	42	12	0.4	15	3	167	0	26	18	0.4	0.7	2.0	<0.01	0.005	0.05	0.3	0.01	0.003	0.0017	0.00	0.00	7.85	312		
C.G.	Unknown	43	5	0.1	6	1	120	0	18	16	0.2	0.2	2.6	<0.01	0.001	0.03	0.2	0.00	0.002	0.0010	0.00	0.00	7.86	227		